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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/945,397	08/30/2001	Gurtej Singh Sandhu	303.541US2	4205

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SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. BOX 2938
MINNEAPOLIS, MN 55402

EXAMINER

TRINH, MICHAEL MANH

ART UNIT PAPER NUMBER

2822

DATE MAILED: 04/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/945,397

Applicant(s)

SANDHU ET AL.

Examiner

Michael Trinh

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 February 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-35 and 109-129 is/are pending in the application.
- 4a) Of the above claim(s) 23-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10-22 and 109-129 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) g. 6) ☐ Other: _____

Art Unit: 2822

DETAILED ACTION

*** This office action is in response to Applicant's amendment filed on February 03, 2003, wherein claims 117-121 have been newly added. Under 37 CFR 126 Rule, new claims 117-121 have been renumbered as claims 125-129, respectively. Accordingly, claims 10-35, 109-124, and 125-129 are pending, in which claims 23-35 are non-elected invention, without traverse.

Claim Rejections - 35 USC § 112

1. Claims 109-124 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for forming a dielectric cap on a top of the sidewalls of the conductive container structure such as in claim 10 with the fill layer formed inside the conductive container structure with a level below a top of the insulating layer formed outside of the conductive container structure, it does not reasonably provide enablement of the method as claimed in independent claims 109, 113, 115, 117, 121, and 123 and in the absence of a fill layer formed inside the conductive container structure with a level below a top of the insulating layer formed outside of the conductive container structure, which are necessarily critical or essential to the practice of the invention before forming a dielectric cap on a top of the sidewalls of the conductive container structure, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). Accordingly, the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims.

2. Claims 10-22 and 109-129 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, and/or first paragraph, as it does not reasonably provide enablement for the claimed method.

Meaning and scope of all of independent claims are unclear, confusing and indefinite, since dependent claims 11, 110, 114, 116, 118, and 122, further recite "...the processing proceeds in the order presented" but it is unclear to determine any other order than the order as recited in these independent claims. For example, claim 110 recites "...of claim 109, the processing proceeds in the order presented"; however, regardless of claim 110, the step of

Art Unit: 2822

forming a conductive container structure in claim 109 must be still performed in the order as recited, and thus before the step of forming a dielectric cap on a top of the sidewalls of the conductive container structure. Accordingly, what are other order of these processing steps of each of independent claims, and such other order must be enable and supported by the specification in forming the device having the dielectric cap on the sidewalls of the conductive container structure as claimed. Apparently, these dependent claims are improper as not further limit base claim. Also in the above dependent claims, the term “the processing” lacks proper antecedent basis.

Re further claims 126, 10, and 12: claim 126 further recites “...occurs subsequent...”; however, base claim 125 already recites “...the following processing steps in the order presented...”. Similarly, claim 12 recites “...occurs subsequent...”; however, as described above, what are other order of these processing steps in base claim 10. Accordingly, meaning and scope of the claims are unclear and indefinite if not improper.

Re further claim 128, the phrase “claim 125, wherein removing the dielectric layer from the insulating layer and the fill layer...” lacks proper antecedent basis. It appears that claim 128 should be dependent of claim 127, not claim 125.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

- (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
- (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claims 109, 110, 113, 114, 117, 118, 121, and 122 are rejected under 35 U.S.C. 102(b) as being anticipated by Dennison (5,206,183).

Art Unit: 2822

Dennison teaches a method for forming a semiconductor device of a container capacitor comprising at least the subsequent steps of: forming a conductive container structure 28 having a closed bottom and sidewalls extending upward from the closed bottom (Figs 3,6,20; cols 4-5; col 6, line 59 through col 7); forming a dielectric cap 75 (Figs 20-21, col 7, lines 29-60) on a top of the sidewalls of the conductive container structure 28 having the dielectric cap 75; and forming the capacitor by forming a dielectric layer 42 thereafter, and forming a cell plate 44 on the dielectric layer 42, wherein the conductive container structure 28 comprises polysilicon, wherein the dielectric cap 75 comprises oxide.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

X 6. Claims 117, 118, 121, and 122 are also rejected under 35 U.S.C. 103(a) as being unpatentable over Dennison (5,206,183) and Clampitt (6,150,691).

Dennison teaches a method for forming a semiconductor device of a container capacitor comprising at least the subsequent steps of: forming a conductive container structure 28 having a closed bottom and sidewalls extending upward from the closed bottom (Figs 3,6,20; cols 4-5; col 6, line 59 through col 7); forming a dielectric cap 75 (Figs 20-21, col 7, lines 29-60) on a top of the sidewalls of the conductive container structure 28 having the dielectric cap 75; and forming the capacitor by forming a dielectric layer 42 thereafter, and forming a cell plate 44 on

Art Unit: 2822

the dielectric layer 42, wherein the conductive container structure 28 comprises polysilicon, and wherein the dielectric cap 75 comprises oxide.

Dennison teaches forming a dielectric layer on the conductive container structure having the dielectric cap, but does not show such structure in drawing figures.

However, Clampitt clearly shows (at figures 27-28,23; col 6, lines 23 through col 7) forming a dielectric cap 162 of silicon nitride on top of the sidewalls of a conductive container structure 163; forming a dielectric layer 164 on the conductive container structure 163 and the dielectric cap 162; and forming a cell plate 166 on the dielectric layer 166.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the capacitor of Dennison by forming a capacitive dielectric layer on the conductive container structure and the dielectric cap as disclosed by Clampitt. This is because of the desirability to protect the top of the sidewalls of the conductive container structure and to electrically isolate individual cell nodes.

7. Claims 111-124 are rejected under 35 U.S.C. 103(a) as being unpatentable over either Dennison (5,206,183) or Dennison and Clampitt (6,150,691), as applied above, and further of Lur et al (5,364,817) and Abernathey et al (4,725,560).

Dennison teaches a method for forming a semiconductor device of a container capacitor as applied to claims 109,110,113,114,117,118,121, and 122 above. Dennison and Clampitt further applied to claims 117,118,121, and 122 above.

Dennison already teaches material of the dielectric cap comprising silicon oxide; whereas, claims 111 and 119 recite silicon oxynitride while claims 113,115,121, and 124 recite selecting dielectric cap material from a group consisting of oxides, nitrides, and silicon oxynitrides. Dennison lacks annealing the dielectric cap in claims 112, 115, 120, and 123.

However, Lur et al teaches (at col 3, lines 38-56) forming a dielectric cap 28 on the sidewalls of a conductive container structure 24, wherein the dielectric cap comprises a dielectric material selected from a group consisting of oxides, nitrides, and silicon oxynitrides. Abernathey et al teach forming silicon oxynitride as a storage dielectric cap material instead of silicon oxide, and annealing the dielectric cap material of silicon oxynitride (col 5, lines 44-68; col 3, lines 16-53; cols 6-7).

Art Unit: 2822

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the dielectric cap of Dennison by alternatively using a dielectric material selected from a group consisting of oxides, nitrides, and silicon oxynitrides as further taught by Lur et al and Abernathey, because the substitution of art recognized equivalent dielectric materials would have been obvious and within the level of one having ordinary skill in the semiconductor art, wherein annealing the dielectric cap of silicon oxynitride as taught by Abernathey would have been obvious to one of ordinary skill in the art because of the desirability to form a high quality silicon oxynitride dielectric cap layer having a high breakdown voltage for storage capacitor, wherein processing steps are obviously carried out in the order as to form the conductive container structure. Additionally, it would also have been obvious to one of ordinary skill in the art at the time the invention was made to form the capacitor electrode of Dennison by employing other well known alternative silicon materials selected from a group consisting of amorphous silicon, polysilicon, and hemispherical grain polysilicon, because the substitution of art recognized equivalent silicon materials for forming the capacitor electrodes would have been obvious and within the level of one having ordinary skill in the art.

8. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dennison (5,206,183) taken with Dennison (5,888,877) or Ahn (5,284,787).

Dennison '183 teaches a method for forming a semiconductor device of a container capacitor comprising at least the subsequent steps of: forming an insulating layer 22 on a substrate (Fig 1); forming an opening in the insulating layer 22; forming a conductive layer 28 on the insulating and exposed portion of the substrate (Fig 2); filling the opening with a fill layer 30 on the conductive layer; removing the conductive layer and the fill layer thereby forming a conductive container structure 28 having a closed bottom and sidewalls extending upward from the closed bottom (Figs 3,6,20; cols 4-5; col 6, line 59 through col 7); forming a dielectric cap 75 (Figs 20-21, col 7, lines 29-60) on a top of the sidewalls of the conductive container structure 28; removing the fill layer 30 to expose inside of the container structure (Fig 6); removing at least a portion of the insulating layer 22 to expose outside of the structure (fig 6); forming the capacitor by forming a dielectric layer 42 on the conductive container structure 28 having the

Art Unit: 2822

dielectric cap 75; and forming a cell plate 44 on the dielectric layer 42, wherein the conductive container structure 28 comprises polysilicon, wherein the dielectric cap 75 comprises oxide.

Dennison '183 lacks removing the conductive and fill layers to a level below a top of the insulating layer thereby forming the container structure.

However, Dennison '877 teaches removing the conductive layer and fill layer to a level below a top of the insulating layer thereby forming a conductive container structure (Figs 6-8; col 6). Ahn '787 teaches removing the conductive layer 200 and fill layer 52 to a level below a top of the insulating layer 32 (Fig 3C) thereby forming a conductive container structure (Figs 3C-3E; col 6, lines 49 through col 7; cols 5-6).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Dennison '183 removing the conductive layer and fill layer to a level below a top of the insulating layer thereby forming a conductive container structure as taught by Dennison '877 or Ahn '787. This is because of the desirability to electrically isolate the rim of the conductive layer, wherein processing steps are obviously carried out in the order as to form the conductive container structure.

9. Claims 15-20, 22, 125 and 126 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dennison (5,206,183) taken with Dennison (5,888,877) or Ahn (5,284,787), as applied above to claims 10-12, and further of Lur et al (5,364,817) and Abernathey et al (4,725,560).

Dennison '183 and Dennison '877 or Ahn teach a method for forming a semiconductor device of a container capacitor as applied to claims 10-12 above.

Dennison '183 already teaches material of the dielectric cap comprising silicon oxide; whereas, claim 18 recites silicon oxynitride and while claim 20 recites selecting dielectric cap material from a group consisting of oxides, nitrides, and silicon oxynitrides. Dennison lacks annealing the dielectric cap in claims 19 and 22.

However, Lur et al teaches (at col 3, lines 38-56) forming a dielectric cap 28 on the sidewalls of a conductive container structure 24, wherein the dielectric cap comprises a dielectric material selected from a group consisting of oxides, nitrides, and silicon oxynitrides. Abernathey et al teach forming silicon oxynitride as a storage dielectric cap material instead of silicon oxide,

Art Unit: 2822

and annealing the dielectric cap material of silicon oxynitride (col 5, lines 44-68; col 3, lines 16-53; cols 6-7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the dielectric cap of Dennison '183 by alternatively using a dielectric material selected from a group consisting of oxides, nitrides, and silicon oxynitrides as further taught by Lur et al and Abernathey, because the substitution of art recognized equivalent dielectric materials would have been obvious and within the level of one having ordinary skill in the semiconductor art, wherein annealing the dielectric cap of silicon oxynitride as taught by Abernathey would have been obvious to one of ordinary skill in the art because of the desirability to form a high quality silicon oxynitride dielectric cap layer having a high breakdown voltage for storage capacitor. It would also have been obvious to one of ordinary skill in the art at the time the invention was made to form the device of Dennison '183 by employing other well known alternative silicon materials selected from a group consisting of amorphous silicon, polysilicon, and hemispherical grain polysilicon for the conductive container structure, by employing other well known alternative insulating materials selected from a group consisting of oxides, nitrides and borophosphosilicate glass for the insulating layer, by employing other well known alternative fill materials selected from a group consisting of photoresist and high etch rate oxides for the fill layer. This is because the substitution of art recognized equivalent materials would have been obvious and within the level of one having ordinary skill in the art.

X 10. Claims 10, 15, 16, 17, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Figura et al (6,255,687) in view of Dennison et al (5,888,877) and Chen (6,077,743).

Rejection and reasons of record are maintained and repeated herein.

X 11. Claims 18, 19, 22, and 109-116 are rejected under 35 U.S.C. 103(a) as being unpatentable over Figura et al (6,255,687) in view of Dennison et al (5,888,877) and Chen (6,077,743), as applied to claims 10 and 20 above, and further in view of Abernathey et al (4,725,560).

Rejection and reasons of record are maintained and repeated herein.

Art Unit: 2822

Response to Arguments

12. Applicant's remarks filed February 03, 2003 have been fully considered but they are not persuasive, and are also moot in view of the new ground(s) of rejection.

**** Regarding rejections of record using Dennison (5,888,877) and Figura (6,255,687):**

Applicant remarked that "...Dennison et al. is assigned to Micron Technology, Inc. ... Accordingly, Dennison et al. and the present application are commonly owned" (remark page 4), and "...both Figura et al. and the present application are assigned to Micron Technology Inc. (remark page 5).

In response, subject matter which is applied in a rejection under 35 U.S.C. § 103(a) based upon prior art only available under 35 U.S.C. § 102(e) may now be disqualified as prior art against the claimed invention if that subject matter and the claimed invention "were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person". However, the fact that the references and the application have the same assignee is **not**, by itself, sufficient evidence. There must be a statement that the common ownership was "at the time the invention was made.". Accordingly, the rejections of record are maintained.

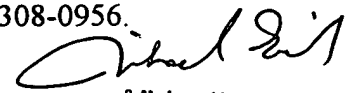
**** The indicated allowability of claims 11-14 and 21 if rewritten in independent form including all of the limitations of the base claim and any intervening claims is withdrawn in view of 112 rejections and the newly discovered reference(s) to Dennison (5,206,183). Rejections based on the newly cited reference(s) above, wherein claims 117-124 are considered and also examined in this office action. Restriction of claims 117-124 are withdrawn.**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (703) 308-2554. The examiner can normally be reached on M-F from 8:30 Am to 4:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (703) 308-4905. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Oacs


Michael Trinh
Primary Examiner